



MATH10282 - 2011/2012

General Information

- Title: Introduction to Statistics
- Unit code: MATH10282
- Credits: 10
- Prerequisites: A-Level Mathematics, MATH10141 *Probability 1*
- Co-requisite units: None
- School responsible: Mathematics
- Members of staff responsible: Dr P Foster

Specification

Aims

The aims of this course unit are to help students

- develop a knowledge of basic statistical concepts and methodology which build on the ideas in probability studied in MATH10141;
- develop practical statistical skills.

Brief Description of the unit

The course gives a general introduction to statistics and is a prerequisite for all future statistics courses.

Learning Outcomes

On successful completion of this course unit students will be able to

- understand introductory statistical ideas and methodology;
- use the statistical computing software R to analyse data.

Future topics requiring this course unit

The statistics content is required for MATH20802, *Statistical Methods* and MATH20812, *Practical Statistics 1*. The background in R is also very useful for MATH20812, *Practical Statistics 1*.

Syllabus

- Populations and samples, random sampling. [1]
- Representing sample data – the histogram, boxplot, numerical summary measures. [2]
- Probability models for data. [2]
- Sampling distributions of sample statistics - the sample mean and its distribution under Normality, using the Central Limit Theorem, the sample proportion, the sample variance, the chi-squared distribution. [2]
- Point estimation – the bias and variance of an estimator, choosing between competing estimators. [2]
- The likelihood function and maximum likelihood estimators for discrete variables. [2]
- Confidence intervals. Single sample procedures for a Normal mean and variance, the population proportion. Two sample procedures for the difference between two Normal means and the difference between two population proportions. [3]
- Hypothesis testing – introductory ideas and concepts. [2]
- Tests based on a single sample – the Normal mean (variance known and unknown), the Normal variance, a non-Normal mean parameter, the Binomial probability parameter. Relationship between CI's and hypothesis testing. [3]
- Calculation of the probability of rejecting the null for a given value of the population parameter. [1]

- Tests based on two independent samples for differences between two Normal means, two non-Normal means, two population proportions. [2]

Textbooks

- G M Clarke and D Cooke, A Basic Course in Statistics (Fourth Edition) Oxford University Press, 1998;
- Robert V Hogg, Introduction to Mathematical Statistics (Sixth Edition) Prentice Hall, 2005;
- Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists (Third edition) Elsevier Science, 2004;
- Michael J Crawley, Statistics: An Introduction Using R. John Wiley & Sons Ltd, 2007

Teaching and learning methods

Two lectures per week plus either an examples class or computing workshop. There will be 4 computing workshops and 7 examples classes. In addition, students are expected to do at least five hours private study each week on this course unit.

Assessment

Two coursework assignments (20%) plus a two hour end of semester examination (80%).

Arrangements